٤ اتصالات قديم

Academic Year 2010/2011	Faculty of Engineering- Tanta University		
	Communications and Electronics Department		Final Exam - 4th Year
		Microwave Electronics	January, 2010 - 2011
	Examiner:	Dr. Mohamed. Abd El-Rahman	Time allowed: 3 hrs.

Answer ALL Questions — Neat Answers and boxed Results are appreciated

Question 1 [17 points]

(a) Why the performance of conventional tubes is impaired at microwave frequencies. State the factors affecting such performance. Also analyze one of them.

(b) For a double cavity klystron (DCK) amplifier derive an expression for the optimum distance L_{opt} between the buncher and catcher at which maximum bunch is formed.

(c) The parameters of a two cavity klystron amplifier are:
$V_0 = 1200$ V, $I_0 = 28$ mA, $f = 8$ GHz, $L = 4$ cm, $d = 1$ mm, $R_{sh} = 40$ KΩ

i) What is the value of the input microwave voltage V_1 required to generate a maximum output voltage V_2.

ii) What is the voltage gain in dB.

iii) What is the efficiency of the amplifier.

iv) Compute the beam loading conductance and show that it can be neglected in the above calculations. **Hint**: $G_B = \frac{G_o}{2}\left[\beta_o^2 - \beta_o \cos(\theta_g/2)\right]$

Question 2 [17 points]

(a) For a reflex klystron oscillator RK, derive an expression for the electronic admittance Y_e. Draw the electronic admittance and state the necessary condition for RK oscillations.

(b) A reflex klystron has an accelerating voltage of $1000\,V$, and oscillates at frequency of $f = 10$ GHz with repeller voltage of $500\,V$. If the cavity is retuned to 8 GHz what is the new value of the repeller voltage for oscillation in the same mode to take place.

Question 3 [17 points]

(a) Discuss the physical operation of the TWTA.

(b) Starting from the TWT characteristic equation:

$$jZ_0 I_0 \beta_e \gamma^2 \gamma_0 = 2V_0({\gamma_0}^2 - \gamma^2)(j\beta_e - \gamma)^2,$$

derive an expression for the backward wave propagation constant within the tube.

(c) A travelling wave tube operates under the following parameters:
Beam voltage $V_0 = 2500$ V, beam current $I_0 = 50$ mA, characteristic impedance of the helix $Z_0 = 6.75\ \Omega$, circuit length $N = 50$ turns, and the applied signal frequency $f = 8$ GHz. Determine:

i) The gain parameter C.

ii) The output power gain A_p.

iii) The four propagation constants.

Question 4 **[17 points]**

(a) In a tunnel diode, state the necessary conditions for tunneling. Draw the I-V characteristic curve of the diode and show the negative resistance region. Draw the circuit diagram of the tunnel diode amplifier in connection with circulator.

(b) A tunnel diode has negative resistance of 20 Ω is connected is series with a load R_L. If the power generated by the diode represents 90% of the output power, find the value of R_L.

Question 5 **[17 points]**

(a) For a two port microwave network, derive expressions for the input and output reflection coefficients (Γ_{in}, Γ_{out}).

(b) An RF amplifier has the following S parameters:

$s_{11} = 0.3\angle{-70^o}$

$s_{21} = 3.5\angle{85^o}$

$s_{12} = 0.2\angle{-10^o}$

$s_{22} = 0.4\angle{-45^o}$

The input terminal of the amplifier is connected to a voltage source with $V_s = 5\angle 0^o$ volts, and source impedance $Z_s = 40\ \Omega$. The output is utilized to drive an antenna which has an impedance of $Z_L = 73\ \Omega$. Assuming that the S parameters of the amplifier are measured with characteristic impedance of $Z_o = 50\ \Omega$. Find the following quantities:

i) Transducer power gain G_T and available power gain G_{av}.

ii) Incident power to the amplifier P_{inc}, input power P_{in}, power available from the source P_{avs}.

You may use the following relations:

Stability gain factor: $k = \dfrac{1-|S_{11}|^2 - |S_{22}|^2 + |\Delta|^2}{2|S_{12}S_{21}|}$, Delta factor: $\Delta = S_{11}S_{22} - S_{12}S_{21}$

Transducer power gain $G_T = \dfrac{1-|\Gamma_S|^2}{|1-\Gamma_{in}\Gamma_S|^2}|S_{21}|^2 \dfrac{1-|\Gamma_L|^2}{|1-S_{22}\Gamma_L|^2}$ or $G_T = \dfrac{1-|\Gamma_S|^2}{|1-S_{11}\Gamma_S|^2}|S_{21}|^2 \dfrac{1-|\Gamma_L|^2}{|1-\Gamma_{out}\Gamma_L|^2}$

Available power gain.. $G_A = \dfrac{1-|\Gamma_S|^2}{|1-S_{11}\Gamma_S|^2}|S_{21}|^2 \dfrac{1}{|1-|\Gamma_{out}|^2|}$, $P_{in} = P_{inc}\left(1-|\Gamma_{in}|^2\right)$ and $P_{inc} = \dfrac{|V_1^+|^2}{2Z_o}$

جامعة طنطا
كلية الهندسة
الفرقة الرابعة(اتصالات)

المادة/ دراسات الجدوى للمشروعات
(EE41H41)
لائحة قديمة

بسم الله الرحمن الرحيم
التاريخ :٢٠١١/١/٢٦
الزمن : ساعتان

أجب عن الأسئلة الآتية:- (٤٠ درجة)

السؤال الاول:-

١- ما هو المشروع ؟- اكتب نبذة مختصرة عن المراحل التى يمر بها المشروع المقترح للاستثمار.

٢- الجدوى الفنية هى إحدى مكونات دراسة الجدوى الاقتصادية - تكلم باختصار عن الجدوى الفنية.

٣- تكلم بالتفصيل عن عناصر التصنيع.

السؤال الثانى:-

١- ما المخزون؟ - لماذا نحتفظ بالمخزون.

٢- ما هى العوامل التى يترتب عليها نقصان أو زيادة العرض؟

٣- لماذا نقوم باعداد دراسات الجدوى الاقتصادية؟ مع شرح تفصيلى لأنواع دراسات الجدوى الاقتصادية.

السؤال الثالث:-

١- ما اهمية المفاضلة بين المشروعات مع شرح لمراحل المفاضلة بين المشروعات.

٢- اذكر اسس ومبادئ عملية تقييم المشروعات.

٣- اذكر اهم نقاط الاختلاف بين معايير الربحية التجارية ومعايير الربحية القومية.

السؤال الرابع:-

١- تكلم بالتفصيل عن اهم البيانات الثانوية اللازمة لاجراء دراسة الجدوى التسويقية.

٢- تكلم بالتفصيل عن البيئة التسويقية.

- اكتب نبذة مختصرة عن التقرير الخاص بك.

مع أطيب التمنيات بالنجاح
ا٠د/عبد الفتاح مصطفى خورشد

TANTA UNIVERSITY | *JANUARY 2011*
FACULTY OFENGINEERING | *TIME ALLOWED: 3 HOURS*
ELECTRONICS&COMMUNICATIONS DEP. | *4th YEAR COMMUNICATION*
(لائحة قديمة)
FINAL EXAMINATION
SUBJECT: ANTENNA DESIGN

Attempt all questions:

1- a- Write down **short notes** about:
i- The main antenna parameters. ii- Advantages of aperture antennas over wire antennas.
iii- Objectives achieved by the antenna arrays.

b- Write down an expression for the array factor of a linear uniform array consisting of N elements. For a large **Broadside array**, derive the needed condition to avoid the presence of grating lobes and the limiting value of the peak-side lobe to main lobe ratio as N increases to a very large value. Estimate the array directivity and beam width considering isotropic elements .

c- Design an **Broadside array** such that no grating lobes exist in the resultant pattern and the peak-side lobe to main lobe ratio is less than **-12.4 dB** with minimum number of elements and maximum spacing. Plot the corresponding array factor and approximately estimate the beam width. If the array is along the X-axis and the elements are short dipoles oriented to Z-direction. Plot the resultant pattern in the X-Y and Y-Z planes. Estimate the directivity of the

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2- a- Write down an expression for the array factor of the **non-uniform linear array** with symmetric feeding in the case of **even number of elements.**

b- For a **9 elements Binomial Endfire array** consisting of short dipoles placed on Z-axis that oriented towards the Y-axis and separated by $\lambda/2$ spacing:
i- Estimate the elements relative feeding coefficients
ii- Plot the array factor as well as the total field pattern in the Z-X and Y-X planes

c- For a **5 elements Broadside Tcheby-chave array** having **-10 dB SLL** and the elements are short dipoles placed on Y-axis that oriented towards the X-axis with $\lambda/2$ spacing:
i- Obtain the elements relative feeding coefficients
ii- Plot the array factor as well as the total field pattern in the Z-X and Y-X planes.

c- For a **6x4 elements** (short dipoles oriented to Z-axis) **planar array** placed in the x-y plane with $d_x = d_y = \lambda/2$ and having the main lobe oriented towards ($\theta_o = 30^0$ *and* $\phi_0 = 90^0$)
Plot the array factor as well as the total field pattern in the Z-X , Z-Y and Y-X planes, then estimate the array gain in the x-y plane.

3- a- (1) Write down an expression for the array factor of a **circular array** placed in the X-Y plane, then, Estimate the **8 elements** phases(α_n) required to orient the main lobe to ($\theta_o = 30^0$ *and* $\phi_0 = 60^0$) if the radius of the array is 4λ .

(2) Sketch the principal pattern for a uniform feeding **8 elements broadside circular array** with a radius of 4λ in the x-y plane where the elements are short dipoles oriented towards **Z-axis.**

b- <u>For the microstrip antenna</u>:
i- Describe the structure, properties and applications.
ii– Obtain an expression for the E and H plane patterns of **a uniformly illuminated microstrip antenna** where the E-filled in the Z- direction and the radiation is in X-direction.

علي القاتق

Tanta University

Department: Electronics and Communications Eng.
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Digital Communications system Date: January 12^{th} 2011 (First term)	Course Code:EE4103 Allowed time: 3 hrs	Fourth Year (Old) No. of Pages: (1)

Answer all the following questions.

Question (1) (15 degrees)

(1) Given an audio with spectral components in the frequency band 300 to 3000 Hz, assume that a sampling rate of 7 kHz will be used to generate a PCM signal, assuming the peak signal-to-noise ratio at the receiver output needs to be at least 30 dB and the polar NRZ signalling is used. Design an appropriate PCM system, as follows:

(a) Draw a block diagram of the PCM system. (5 deg.)

(b) Specify the number of uniform quantization steps. (3 deg.)

(c) The channel null bandwidth required. (3 deg.)

(d) Determine the signal-to-noise ratio for a μ companding with μ=10. (4 deg.)

Question (2) (25 degrees)

(1) Consider a deterministic test pattern consisting of alternating binary 1s and 0 s. Calculate the PSD for the following types of signalling formats as a function of T_b, where T_b is the time needed to send 1 bit of data

(a) Unipolar NRZ signalling. (6 deg.)

(b) Unipolar RZ signalling where the pulse width τ is $\tau = (3/4)\ T_b$. (6 deg.)

(c) Determine the first null bandwidth of these signals. (3 deg.)

(2) Given two analog waveforms $w_1(t)$ and $w_2(t)$ where $w_1(t)$ is bandlimited to 3 KHz and $w_2(t)$ is bandlimited to 9 KHz. These two signals are to be sent by TDM over PAM type system.

(a) Determine the minimum sampling frequency for each signal and design a TDM commutator and decommutator to accommodate these signals. (5 deg.)

(b) Draw some typical waveforms for $w_1(t)$ and $w_2(t)$, and sketch the corresponding TDM PAM waveforms. (5 deg.)

Question (3) (25 degrees)

(1) A delta modulator (DM) is tested with a 10 KHz sinusoidal signal, 1 V peak-to-peak at the input. It is sampled at 10 times the Nyquist rate.

(a) Draw the block diagram of the DM system and explain the quantization noise of the DM signal. (6 deg.)

(b) What is the step size required to prevent slope overload noise? (4 deg.)

(c) If the receiver input is bandlimited to 200 KHz, What is the average signal/quantization noise power ratio? (5 deg.)

(2) Consider a sinusoidal signal is sampled at the Nyquist rate using instantaneous sampling, and is modulated by using the pulse width modulation (PWM).

(a) Sketch the PWM modulator and the corresponding output signal. (5 deg.)

(b) Sketch the PWM demodulator. (5 deg.)

Question (4) (20 degrees)

(1) A binary data signal is differentially encoded and modulates a PM transmitter to produce a differentially encoded phase-shift-keyed signal (DPSK). The peak-to-peak phase deviation is 180° and f_c is harmonically related to the bit rate R.

(a) Draw the block diagram for the transmitter, including the differential encoder. (5 deg.)

(b) Show the waveforms at various points on the block diagram if the input data sequence is (01011000101). (10 deg.)

(c) Illustrate with the block diagram the DPSK detectors. (5 deg.)

Good Luck

Dr. *Entessar Said*

4- **a-If a** uniformly illuminated circular aperture **with directivity 23.922 dBs** with the H- field in Y- direction:

i- Estimate the radius and the 3-dB beam width of the aperture.

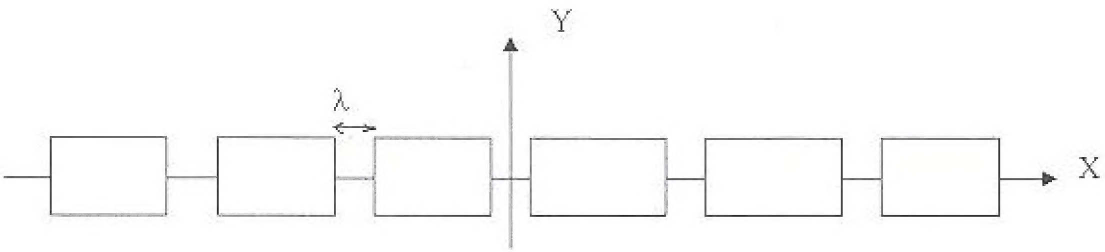
ii- Find and sketch the total field pattern in both E and H planes.

b- The shown arrangement represents a broadside array that consists of 6 $(5\lambda x 3\lambda)$ rectangular apertures **fed with the dominant mode** :

i- Find and sketch the field pattern of one aperture in both E and H planes

ii- Find and sketch the total field pattern in both E and H planes.

iii- Estimate the beam width and the gain of each element and those of the array.



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c- (1) Discuss the main applications of the parabolic reflector antenna **.then** derive the relation between the $\frac{F}{d}$ ratio and the reflector subtended angle θ_0 .

(2) For the special case of feeding pattern on the form $G_f(\theta') = k\cos^2(\theta')$,derive an expression for the illumination efficiency η_{ill} and sketch it versus the reflector subtended angle θ_0

(3) Design the previous parabolic reflector antenna when having maximum directivity of 30 dBs at 6 GHz

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" ربِ اشرح لي صدري ويسر لي أمري"

Dr. Abdel-Fattah A. Abu-Hashem

قديم رابطة أتصالات

Tanta University

Department: Electronics and Electrical Communication Eng.

Faculty of Engineering

Total Marks: 60 Marks

Course Title: Testing and Electronic measurements (1)	Course Code: EEC4101	Year: 4th
Date: 17/1/2011 (First term)	Allowed time: 3 hrs	No. of Pages: (1)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches, equations)

Question 1 (15 Marks)

(A) Sketch the block diagram of sampling process.

(B) Explain the effects of sampling frequencies and sampling pulse width on the recovered signal

(C) Compare between the Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM).

Question 2 (15 Marks)

(A) Draw the block diagram of delta modulation system.

(B) Derive delta sigma modulation system from delta modulation system.

(C) Discuss the disadvantages of delta modulation.

Question 3 (15 Marks)

(A) Compare between PAM, PWM, and PPM.

(B) How to generate PWM ?

(C) How to generate PPM ?

(D) Draw the block diagram of PPM, specifying with aid of sketch the output of each stage.

Question 4 (15 Marks)

(A) Explain Pulse Code Modulation (PCM).

(B) Show how to detect and correct errors in a message signal. Give an example for each.

Best Wishes of Success

د. هدى [illegible]